

A NEW SPECIES OF *LIRIS* FABRICIUS FROM CHINA, WITH A KEY TO THE CHINESE SPECIES (HYMENOPTERA: CRABRONIDAE)¹

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ABSTRACT: *Liris ferrugineimarginalis* new species from Guangdong and Fujian, China, is described and illustrated. A key to the Chinese species of the genus is provided.

KEY WORDS: Hymenoptera, Crabronidae, *Liris*, new species, China

Liris Fabricius is a large cosmopolitan genus, most species of which inhabit the tropics. Pulawski listed 308 species and 32 subspecies of the genus *Liris* in the electronic Catalog of Sphecidae in October 2006. Six species and three subspecies occur in the Palaearctic, 94 species and 6 subspecies in the Oriental, 1 species and 2 subspecies in the Nearctic, 38 species in the Neotropical, 47 species and 4 subspecies in the Australian, 71 species and 14 subspecies in the Ethiopian, 5 species and 3 subspecies in the Palaearctic and Oriental, 8 species in the Palaearctic and Ethiopian, 6 species in the Oriental and Australian, 24 species in the Nearctic and Neotropical, 1 species in the Oriental and Nearctic, 2 species in the Palaearctic, Oriental and Australian, 2 species in the Palaearctic, Oriental and Ethiopian, 1 species in the Palaearctic, Ethiopian and Australian, 2 species in the Palaearctic, Oriental, Australian and Nearctic regions (Bohart and Menke, 1976; Tsuneki, 1976, 1982, 1983a, 1983b; Krombein and Shanks Gingras, 1984; Amarante, 2002). Sixteen species and five subspecies have been recorded from China (Smith, 1856; Bingham, 1897; Cameron, 1903; Dover, 1926; Richards, 1928; Gussakovskij, 1938; de Beaumont, 1961; Bohart and Menke, 1976; Tsuneki, 1966, 1967, 1971, 1972, 1983b; Pu, 1986; Wu and Zhou, 1996; Porter et al., 1999). During our study of the Chinese material of *Liris*, a new species from Guangdong and Fujian was discovered. A key to the Chinese species of *Liris* is provided and the new species is described and illustrated. For the terminology we mainly follow Bohart and Menke (1976).

The diagnosis for *Liris* Fabricius is as follows: lateral ocellus reduced, flat and small; frons just below median ocellus with a transverse swelling extending from eye to eye and interrupted by median frontal line, and a linear swelling along inner orbit which joins transverse swelling to form an M shape; mandible simple, most species with a conspicuous notch on outer margin, mostly with one or two teeth on inner margin; pronotal collar, scutum, scutellum and metanotum

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punctuate, punctures longer than one to less than one diameter apart; forewing with three submarginal cells; pronotum is angular in dorsal view, and gaster without petiole. *Liris* Fabricius can be distinguished from *Larra* Fabricius by the following combination of the following characters: in female, last tarsomere angled in lateral view and sides parallel on apical half, pygidial plate mostly with setae and in most species with apically a transverse row of stout apical spinules; in male, propodeal side impunctate and dull or if shiny, then at most with sparse pinprick punctures, fore and hind femur excavate ventrally in some species. Body length 5.0 – 30.0 mm.

METHODS

The material examined during this study is deposited in the following institutions: Zhejiang University, Hangzhou, Zhejiang; Institute of Zoology, Academia Sinica, Beijing, China; China Agricultural University, Beijing; Nanjing Agricultural University, Nanjing, Jiangsu; Shandong Agricultural University, Taian, Shandong; Northwest Science-Technology University of Agriculture and Forestry, Yangling, Shanxi; South China Agricultural University, Guangzhou, Guangdong; Hebei University, Baoding, Hebei; Yunnan Agricultural University, Kunming, Yunnan.

The specimens were observed and figured with the aid of an Olympus stereomicroscope (SZ Series, Japan) with an ocular micrometer. The ratios used in the species descriptions were calculated at the same magnification.

SYSTEMATICS

Key to females of *Liris* from China

1. Mandible without notch on outer margin, pubescence on head and thorax golden, scape and pedicel, legs except basal portions ferruginous, wings purplish dark brown, body length 15.0–22.0 mm. Borneo, Caroline Islands, China (Guangdong, Hainan, Yunnan, Hong Kong, and Taiwan), Guam, Hawaiian Islands, India, Indonesia, Java, Malaysia, Mariana, Marshall, New Guinea, Philippines, Ryukyu and Okinawa Islands, Sri Lanka, Thailand.....
.....*L. aurulentus* (Fabricius), 1787
- Mandible with well-defined notch on outer margin 2
2. Pygidial plate aetose or nearly so 3
- Pygidial plate setose 5
3. Pygidial plate dull, alutaceous, tarsal claws with tooth near base, mandible without teeth on inner margin, body length 12.0–13.0 mm. China (Guangdong, Yunnan, and Taiwan).....*L. larroides taiwanus* (Tsuneki), 1967
- Pygidial plate polished, tarsal claws without tooth, mandible with two teeth on inner margin 4
4. Pygidial plate apically with short, stiff setae; pronotum not thick; anterior margin of clypeus somewhat rounded, mandible mostly black; body length 9.0–13.0 mm. Botel Tobago Islands, Burma, China (Beijing, Hebei, and

- Henan), India, Malaysia, Mongolia, North Africa south to Sudan and Eritrea, Southern Europe, Southwestern and Central Asia
*L. niger* (Fabricius), 1775
- Pygidial plate asetose, pronotum comparatively thick, clypeus broadly rounded anteriorly, mandible mostly red, body length 10.0–12.0 mm. China (Yunnan and Taiwan), India, Philippines, Thailand.....
*L. fuscinervus* (Cameron), 1905
5. With a transverse sulcus adjacent to the free margin of the lateral clypeal lobe, a coarsely rugose propodeal dorsum, and the presence of a subbasal tooth on the female claw; body length 12.5 mm. China (no specific locality), Sri Lanka *L. vigilans* (F. Smith, 1856); ♂ unknown
- Without a transverse sulcus adjacent to the free margin of the lateral clypeal lobe, or without a subbasal tooth on the female claw 6
6. Mesopleuron sparsely punctuate, punctures distinctly more than one diameter apart, interspaces polished, body length 8.0–10.0 mm. Africa, China (Jiangsu), Southwestern Europe, Southwestern and Central Asia
*L. nigricans* (Walker), 1871
- Mesopleuron punctuate or rugose, punctures no more than one diameter apart, interspaces dull 7
7. Gaster pruinose, middle sterna with long, black, stiff setae, body length 7.0 mm. China (Hong Kong), India *L. anthracinus* Kohl, 1892; ♂ unknown
- Gaster not pruinose or at most apical portions of segments with bands of pile, middle sterna without long black stiff setae in most specimens 8
8. Side of propodeum coarsely reticulate, body length 8.0–11.0 mm. Burma, China (Guangxi), India, Indonesia, Java, Okinawa
*L. tristis* (F. Smith), 1856; ♂ unknown
- Side of propodeum punctuate or obliquely rugose, not reticulate 9
9. Pronotum, at least in middle, raised high, nearly reaching level of scutum ..
10
- Pronotum depressed much below level of scutum 12
10. Gaster with four silvery bands of pile, head and thorax densely with silvery or whitish pubescence, body length 7.0–8.5 mm. China (Taiwan), Philippines, Ryukyu Islands, Thailand *L. albopilosus* Tsuneki, 1967
- Gaster with three silvery bands of pile, pubescence on head and thorax sparse 11
11. Lateral carina of propodeum strong and complete, rugae on side of propodeum mainly longitudinal, punctures on mesopleuron minuter and sparser, body length 6.0–12.0 mm. China (Yunnan, Guangdong, Zhejiang, and Taiwan), Japan, Korea, Ryukyu Islands, Thailand.....
*L. festinans japonicus* (Kohl), 1884
- Lateral carina of propodeum not strong or complete as above, rugae on side of propodeum oblique, punctures on mesopleuron coarser and sparser, body

- length 6.5–8.5 mm. China (Taiwan), Fiji, Guam, Mariana and Caroline Islands, Micronesia, New Caledonia, Philippines, Samoa
*L. festinans manilae* (Ashmead), 1904
12. Head and thorax closely with golden or brassy pubescence, punctures on clypeal anteriorly extending to margin and fairly dense, wings markedly yellowish 13
- Head and thorax with appressed silvery pile 14
13. Large species, body length 16.0–21.0 mm, setae erect on vertex and thorax, mesopleuron rugose, setae on pygidial plate dark brown, interocular distance at vertex slightly shorter than flagellomere I, clypeus broadly rounded anteriorly, its free margin slightly emarginate mesally. China (Sichuan, Fujian, Yunnan, Jiangsu and Taiwan); Ryukyu Islands.....
*L. deplanatus binghami* Tsuneki, 1967
- Medium-sized species, body length 11.0–16.0 mm, setae on head and thorax appressed, mesopleuron punctuate, setae on pygidial plate golden, interocular distance on vertex longer than flagellomere I, free margin of clypeus not emarginate. Burma, China (Yunnan and Taiwan), Malaysia, Mariana Islands, Micronesia, Philippines, Solomon Islands, Thailand.....
*L. laboriosus* (F. Smith), 1856
14. Tibiae, tarsi, hind femur, and mandible mostly red, body length about 12.0 mm. China (Yunnan and Taiwan), Philippines, Thailand
*L. larriformis* (F. Williams), 1928
- At least tibiae and tarsi black 15
15. Interocular distance on vertex less than flagellomere I, lateral carina of propodeum complete 16
- Interocular distance on vertex equal to flagellomere I, lateral carina of propodeum in most specimens lacking, at most ill defined 19
16. Apical margins of each gastral segment narrowly ferruginous, rhinaria present on flagellomeres IV–IX, elongate, elliptic, anterior margin of clypeus mostly smooth, sparsely punctuate, wings brown, body length 13.0 mm. China (Guangdong and Fujian)*L. ferrugineimarginalis* sp. nov.
- Apical margins of gastral segments black, rhinaria present on flagellomeres V–IX 17
17. Large, deep-black species, body length 17.0–20.0 mm, wings strongly infumate, with purplish shimmer, three bands of sparse brownish pile on gaster narrow, ill defined, setae of pygidial plate dark brown. China (Zhejiang, Jiangxi, Sichuan, and Taiwan), Ryukyu Islands... *L. surusumi* Tsuneki, 1966
- Medium-sized species, less black due to more marked pile, wings not so strongly infumate, three bands on gaster fairly well-defined as seen from certain angles 18
18. Body and wings much darker, with three bands of pile on gaster and setae of pygidial plate dark brown, body length 12.0–16.0 mm. China (Taiwan), Ryukyu Islands.....*L. rohweri formosanus* Tsueki, 1973

- Body and wings less dark, with four bands of pile on gaster and setae of pygidial plate golden, body length 11.0–15.0 mm. China (Yunnan and Taiwan), Philippines, Ryukyu Islands.....
.....*L. rohweri rohweri* (F. Williams), 1928
- 19. Median lobe of clypeus broad, apical bevel of clypeus impunctate and polished, body length 12.0–15.0 mm. Bismarck Archipelago, Borneo, China (Taiwan), Malaysia, Okinawa, Philippines, Ryukyu Islands, Thailand.....
.....*L. difficilis* Tsuneki, 1983b
- Median lobe of clypeus comparatively narrow, apical bevel with transverse series of punctures below, or sparsely punctured, dull, body length 12.0–16.0 mm. Bismarck Archipelago, Botel Tobago Islands, China (Jiangsu, Zhejiang, Fujian, Guangdong, Hainan, Yunnan, Taiwan, and Hong Kong), Central to South Asia, Fiji, Hawaiian Islands, Japan, Marshall Islands, Mediterranean basin, Micronesia, Solomon Islands *L. subtessellatus* (F. Smith), 1856

Key to males of *Liris* from China

1. Mandible without notch on outer margin, scape, pedicel, and legs except basal portions ferruginous, clypeus not excavate and anterior margin of clypeus not truncate, body length 10.0–22.0 mm. Distributions as the female
.....*L. aurulentus* (Fabricius), 1787
- Mandible with well-defined notch on outer margin; scape, pedicel, or legs not ferruginous; clypeus different 2
2. Mandible without teeth on inner margin, at most very weakly incised toward middle, rhinaria on flagellomere III only, in an elliptic flattened impression, length about 9.0 mm..... *L. larroides taiwanus* (Tsuneki), 1967
- Mandible with one or two teeth on inner margin 3
3. Anterior margin of clypeus obtusely angulate, distinctly prominent in middle, length relation among abscissae of radial vein of forewing: $2 < 5 < 3 < 4 < 1$, body length 7.0–9.0 mm..... *L. niger* (Fabricius), 1775
- Anterior margin of clypeus not obtusely angulate, length relation among abscissae of radial vein of forewing usually $4 > 1 > 3 > 5 > 2$ 4
4. Mesopleuron sparsely punctuate, punctures distinctly more than one diameter apart, interspaces polished, hind femur simple, body length 5.0–8.0 mm.
.....*L. nigricans* (Walker), 1871
- Mesopleuron punctuate or rugose, punctures equal to or less than one diameter apart, interspaces not polished, hind femur excavate ventrally in some specimens 5
5. Pubescence on frons and clypeus golden, at least with brassy luster 6
- Pubescence on frons and clypeus silvery..... 9
6. Apical margin of each gastral segment ferruginous, interocular distance on vertex less than combined length of pedicel and flagellomere I, rhinaria on flagellomeres II–XI, on II–X extending over full length of each segment, on XI about 0.75 length, body length 11.0 mm
.....*L. ferrugineimarginalis* sp. nov.

- Apical margin of gastral segments black7
- 7. Four broad silvery bands of pile on gaster, wings yellowish, apically fuscous punctures on vertex, scutum and mesopleuron minute, body length 10.0–12.0 mm.*L. laboriosus* (F. Smith), 1856
- Three bands of pile on gaster, wings markedly darkened, punctures on vertex and scutum comparatively coarse, at least subalar epimeral area of mesopleuron with reticulate rugae 8
- 8. Pile on frons and clypeus deep golden, clypeus nearly truncate apically, rhinaria with surface smooth, body length 9.0–13.0 mm.....*L. deplanatus binghami* Tsuneki, 1967
- Pile on frons and clypeus pale yellow, clypeus roundly produced anteriorly, body length 11.5 mm..... *L. surusumi* Tsuneki, 1966
- 9. Pronotum thick, not transversely carinate on top, mesally raised nearly to level of scutum, body length 7.0–9.0 mm*L. fuscinervus* (Cameron), 1905
- Pronotum compressed in front, flattened anteriorly, with top transversely ridged, below level of scutum..... 10
- 10. Tibiae, tarsi, and hind femur wholly and mandible mostly red, clypeus anteriorly polished, nearly truncate apically, without median incision, body length 7.0–8.0 mm. *L. larriformis* (F. Williams), 1928
- Tibiae, tarsi, hind femur and mandible black or at most brown11
- 11. Pronotum in middle raised nearly to level of scutum, punctures on scutum comparatively coarse, with well-defined interspaces, radial cell of forewing with apex more or less obliquely truncate 12
- Pronotum depressed much below level of scutum, punctures on scutum minute and dense, radial cell of forewings truncate apically 14
- 12. Clypeus on anterior margin with median tooth, silvery pubescence on frons, clypeus, gena and thorax thick, dense and long, body length 5.0–7.0 mm.
.....*L. albopilosus* Tsuneki, 1967
- Clypeus on anterior margin without median tooth, silvery pubescence on frons, clypeus, gena and thorax not thick, dense or long 13
- 13. Interocular distance on vertex slightly less than combined length of pedicel and flagellomere I, clypeus gently rounded and slightly produced in middle, body length 5.0–6.5 mm..... *L. festinans manilae* (Ashmead), 1904
- Interocular distance on vertex distinctly less than combined length of pedicel and flagellomere I, clypeus roundly produced anteriorly, not produced medially, body length 5.0–10.0 mm.....*L. festinans japonicus* (Kohl), 1884
- 14. Interocular distance on vertex distinctly less than combined length of pedicel and flagellomere I, pubescence on fore femur ventrally long and erect, wings fairly markedly darkened, lateral carina of propodeum complete.....15
- Interocular distance on vertex longer than or as long as combined length of pedicel and flagellomere I, pubescence on fore femur ventrally short and flat-

- tened, wings slightly darkened or yellowish, apically darker, lateral carina of propodeum incomplete or lacking 17
15. Body and wings very dark, with only three bands of pile on the gaster, clypeus slightly rounded, body length 8.0–10.0 mm.....
.....*L. rohweri formosanus* Tsuneki, 1973
- Body and wings less dark, with four bands of pile on the gaster16
16. Clypeus not emarginate medially, without sharp lateral angles, body length 6.7 mm. China (Taiwan).....*L. menkei* Tsuneki, 1972; ♀ unknown
- Clypeus distinctly emarginate medially, with sharp lateral angles, body length 8.0–13.0 mm.....*L. rohweri rohweri* (F. Williams), 1928
17. Interocular distance on vertex distinctly longer than combined length of pedicel and flagellomere I, as long as combined length of flagellomeres I and II, body length 5.5 mm China (Taiwan)*L. hanedai* Tsuneki, 1971
- Interocular distance on vertex as long as combined length of pedicel and flagellomere I, distinctly less than combined length of flagellomeres I and II ...
.....18
18. Pubescence of femur fairly long ventrally, wings markedly fuscous, stigma and veins black, body length 14.0 mm. China (Taiwan
.....*L. fuscatus* Tsuneki, 1971; ♀ unknown
- Pubescence of femur short ventrally, wings hyaline, apical margin darkened, stigma and veins brown 19
19. Fore femur slightly excavate ventrally, median lobe of clypeus broad, paramere of the male genitalia slender, body length 7.0–12.0 mm.
.....*L. difficilis* Tsuneki, 1983
- Fore femur strongly excavate ventrally, median lobe of clypeus narrow, paramere of the male genitalia stout, body length 7.0–12.0 mm.
.....*L. subtessellatus* (F. Smith), 1856

Liris ferruginimarginalis, NEW SPECIES

Figures 1-8

Diagnosis. This new species can be distinguished from the related *L. silvicola* (F. Williams), 1928 and all other species of the genus by the following combination of characters: apical margin of each gastral segment ferruginous; anterior part of clypeus broadly smooth, sparsely punctate, with median incision in female, emarginate apically in male; wings hyaline and partly brown, male genitalia unique.

Description. Female. Body length 13.0 mm. Black except the following: tibial and tarsal spines, apical margin of each gastral segment ferruginous; mandible apically dark ferruginous; palpi, tegula, stigma and veins of wings dark brown; wings hyaline and partly brown. Head, thorax, and gastral segments I-IV with silvery pubescence, pygidial plate (Fig. 3) with setae stiff, long and recumbent, and with a few erect longer setae, apical margin with 6 long spinules.

Frons and vertex sparsely punctate, punctures on upper portion about one diameter apart, those on lower portion more than one diameter apart. Interocular distance on vertex less than length of flagellomere I. Flagellomere I as long as II and 3.2 times as long as apical breadth. Rhinaria on flagellomeres IV-IX, elongate, elliptic, on IV very small, on V about 0.1 length of the segment, on VI about 0.2 length of the segment, on VII-IX about 0.25 length of each segment. Clypeus (Fig. 1): anterior part broadly smooth, sparsely punctate, with median incision. Mandible with two teeth on inner margin.

Thorax closely punctate, punctures distinctly less than one diameter apart, but those on scutum larger, those on metanotum sparser, about one diameter apart, metapleuron with oblique rugae, interspaces between rugae polished; propodeal dorsum reticulate, without median carina, with lateral carina; side of propodeum alutaceous, sparsely obliquely, finely rugose; posterior side of propodeum alutaceous, basally with median furrow, sides of furrow sparsely, transversely rugose. Length relation among abscissae of radial vein of forewings: $5 < 2 < 3 < 1 < 4$.

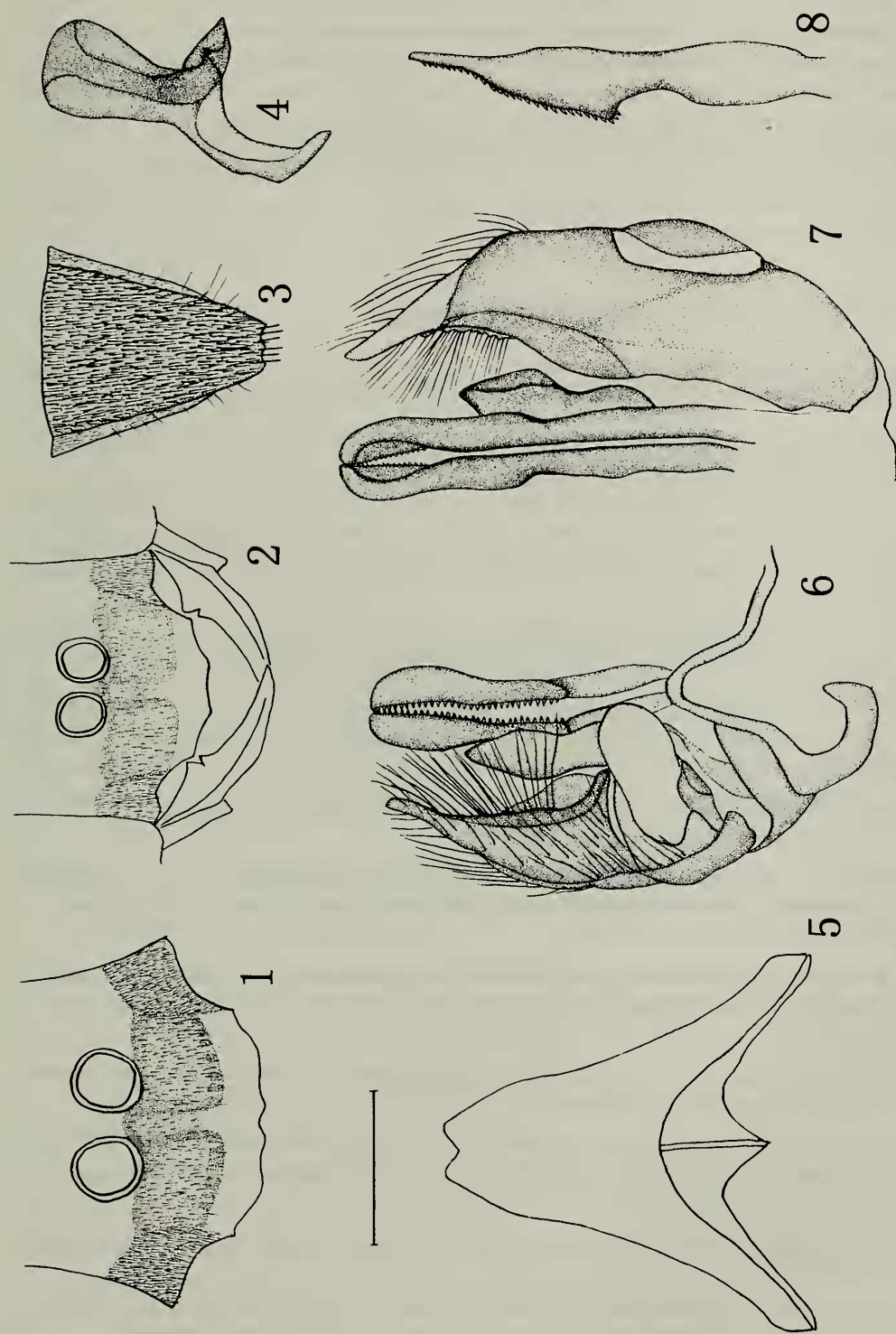
Pygidial plate (Fig. 3); length of tergum I: width at posterior margin = 69: 127.

Male. Body length 12.0 mm. Similar to female. But pubescence on frons and clypeus golden, wings pale brown, the ferruginous apical margin of each segment wider than in female. Interocular distance on vertex longer than the length of flagellomere I, shorter than combined length of pedicel and flagellomere I. Flagellomere I subequal to II and about 2 times as long as apical breadth. Rhinaria on flagellomeres II-XI, on II-X extending over full length of each segment, on XI extending 0.75 length of the segment. Median lobe of clypeus (Fig. 2) narrower than in female, anterior margin medially emarginate. Fore femur distinctly excavate ventrally, hind femur slightly excavate ventrally. Propodeal dorsum reticulate, with short median carina; lateral side of propodeum alutaceous, thin and oblique rugae closer than in female. Gaster without pygidial plate, length of tergum I: width at posterior margin = 59: 82. Length relation among abscissae of radial vein of forewings: $5 < 2 < 3 < 1 < 4$. Sternum VIII (Fig. 5), lateral view of volsella (Fig. 4), inside view of right paramere (Fig. 6), dorsal view of right paramere (Fig. 7), lateral view of penis valve (Fig. 8).

Material Examined. Holotype: ♀, China, Guangdong, Huizhou, Xiangtou Mountain, 18. May 2002, Zaifu Xu; deposited in the Insect Collections of Zhejiang University, Hangzhou, Zhejiang. Paratypes: 1♂, China, Guangdong, Huizhou, Xiangtou mountain, 18 May 2002, Zaifu Xu; 1♂, China, Guangdong, Xinyi, Dawuling, 5 May 2002, Zaifu Xu; 1♀, China, Hainan, Limu Mountain, 14 July 2002, Zaifu Xu; all paratypes deposited in the Insect Collections of Zhejiang University, Hangzhou, Zhejiang.

Distribution: China: Guangdong and Fujian.

Etymology. The name *ferrugineimarginalis* derived from the Latin words: ferrugineus (= ferruginous) and marginalis (= marginal), with reference to the ferruginous apical margin of each gastral segment in both sexes.



Figures. 1–8. *Liris ferruginimarginalis*, new species. Female. 1, 3. Male 2, 4–8. 1, 2. Frontal view of clypeus. 3. Dorsal view of pygidial plate. 4. Lateral view of volsella. 5. Sternum VIII. 6. Inside view of right paramere. 7. Dorsal view of right paramere. 8. Lateral view of penis valve. Scale bars for Figures 1–3 = 1.0 mm; for Figures 4–8 = 0.49 mm.

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